DOCUMENT RESUME

ED 146 598 CS 203 711

AUTHOR Donovan, Timothy R.
TITLE Math and English as Integrated Discourse.
PUB DATE [77]
NOTE 8p.; Study prepared at Northeastern University

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Composition (Literary); *Composition Skills (Literary); *English Instruction; Integrated Activities; *Integrated Curriculum; *Interdisciplinary Approach; Mathematical Applications; *Mathematics Instruction; *Teaching Techniques

ABSTRACT

Unfortunately, a barrier between English and mathematics exists, and it is maintained by separating the two disciplines in educational curricula. This paper addresses the need to integrate mathematics and composition instruction, focusing on the effective use of mathematical notation as a tool that students can use to present ideas clearly and forcefully. Methods for approaching mathematics and English as integrated discourse are discussed. (RL)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED146598

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Timothy R. Donovan

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND THE ERIC SYSTEM CONTRACTORS."

Timothy R. Donovan
Northeastern University

MATH AND ENGLISH AS INTEGRATED DISCOURSE

Most students can invariably think, speak, and write in two languages, yet in composition classes generally rely on only one: English. The other is the more "universal language" of mathematics.[1] That instruction in the latter should reside in a separate department is, of course, rather necessary; however, mathematical notation is virtually non-existent in the written discourse of students, although both expository prose and mathematics observe, describe, and classify phenomena by their representative symbol systems. Both discursive and numerical language also frequently explain by deductive, evidentiary procedures and have in common the search for reliability and authority with which to make judgements. Why, then, the nearly total disassociation of math from English, and is this inevitable?

One obvious fact is that students frequently avoid math out of simple fear, recently popularized as "mathophobia." The source of this fear is, in part, conditioning. Disdain or defensiveness about math prevails in the society at large, constantly reinforcing in many students the difficulty or the esoteric nature of the discipline. They are taught to be afraid of it in their homes, by their peers, and even by non-math instructors. Moreover, a latent fear sometimes exists over a perceived trade-off between mathematical competence and what we may call human relations. In its more advanced stage there is the sense that when one gains power over the symbol, the sym-

CS203 711

bol ultimately gains power over the individual at the expense of other values. Secondly, the students' lack of familiarity with the system induces them (programs them, really) to select out or avoid mathematical symbols in reading and writing. Since language is attained, partly, through the need to express or acquire, we may presume that the need is not firmly established, either in a curriculum or in society at large.

Other problems pertain to reading and the embedding of numerics into the lexography. For example, it is often the case that numerics are frequently not in the more emphatic main clause of the sentence but are subordinated in some way, or even relegated to a footnote, and less likely to catch the reader's eye and comprehension. Another contextual problem may be the levels of abstraction involved in traversing lexical and numerical symbols. Symbols are generally conventional and used to communicate in both math and English. But the reader, writer, and speaker must match symbols to referents, although the symbol is more abstract than its referent. If a word is seen as symbol of a symbol (the idea), it is quite likely students may see a number not as part of another, different symbol system, but as a symbol thrice removed from its referent. Thus math may, practically speaking, be a quantum jump in the level of abstraction and thus outside or above the continuum of ordinary written or spoken language. In a composition, "many people are out of work" might be improved by writing "the unemployment rate is now at 9%," but often it is not. Ironically, mathematics as a symbol system is usually conceived of as a concise, economical, and concrete science but, as we frequently observe, may be avoided as too abstract for ordinary discourse.

Finally, certain conceptual problems impede the reciprocal relation between math and English as discourse. The numerically (as well as verbally) weak student may, in terms of his development, be retarded at the stage of rote memorization. If forced to proceed in an inflexible, linear program of learning, he may fail at some point to grasp the conceptual background of the terms and processes. Structural insights may elude him; if required to solve problems before attaining the higher intellectual function demanded, he may produce the right answer but by inappropriate means. As a consequence he remains fixed, often for a lifetime, at the lower level. Moreover, because he still naively sees the discipline as a black or white, right or wrong, affair, he is unlikely to appreciate the value it can have in the deliberative, variable process of, say, a composition. It is simply not in his normal intellectual repertoire.

Clearly, there does exist generally a formidable language barrier between mathematics and English. James Moffett in Teaching the Universe of Discourse attempts to fix the blame partly on an educational curriculum which, in breaking down knowledge into subjects, succeeds in breaking down "the essential continuity between the specialized notation of mathematics and ordinary language, and between the semantic power of mathematics and the data upon which this power can be brought to bear."[2] The language barrier is not toppled, then, by leaving math to the mathematicians and English to language instructors.

A composition course that would integrate math and English as discourse could be structured in many ways. It might be slanted toward language awareness, logic, the research paper, heuristics, or combinations thereof. It

might even be a course undefined by the traditional rubrics of math and English. I have experimented, however, with the traditional rhetorical mode of argumentation simply because it seemed a prominent use of both. Initially such a course would probably look like many traditional composition courses: some reading, some discussion, writing about once a week. While some might see limitations to that approach, it would seem that efforts to overcome a young lifetime's worth of impairment would have to be holistic. Each of the components would have to be mutually supportive in the three general areas of communication--verbal, reading, and writing skills--if the students are to achieve some facility in moving back and forth between the numerical and the lexical realms.

The course might begin with a frank discussion validating the problem. Most students would readily concede, without much coaxing, that they rarely see any connection between math and English, that they tend to skip over numerics when encountered in prose, that they are often uncomfortable with math and tend to avoid it whenever possible. And while their universe hardly seems to resemble Galileo's, which was "written in the language of mathematics," they might be willing to see what could be done about it in, of all places, an English class.

Selected readings would include those which argued and informed using numerical evidence. These might be excerpted essays on contemporary life, such as the debate over national health insurance, the economic systems of capitalist and socialist nations, and the ethical underpinnings of the U.S. tax structure, or Isaac Assimov's The Realm of Numbers, an engaging explanation of the evolution and use of numerical symbolization.[3] In re-

viewing the content of these readings, one would be careful to examine the frequency with which the authors support assertions with numerical data and speculate as to their meaning, purpose, and validity. Students could suggest what other data might be available or, even, what the author might have overlooked, deliberately or not. Some transliteration, both within and between symbol systems could be undertaken to see what effect, if any, it might have in meaning or understanding. For example, when that 9% unemployment rate becomes "eight million people out of work", its impact might be seen as more dramatic.

General discussion provoked by the readings would tend to take the form of either agreement or disagreement. While many a student argument could be cogently presented without numerical references, those supported with them might be more authoritative. Disagreement, however, could create an awareness of gaps in knowledge, particularly of the statistical variety, and, more importantly, the need to acquire and communicate new information. Such an awareness could lead to an understanding that knowledge can be enlarged and modified by numerical symbols. In addition, students and instructor might be surprised to hear themselves frequently speaking in numerical symbols as a means of expression and clarification--a sure sign of progress.

Writing tasks would pertain to the issues in the readings and discussions, demanding not just the presentation of statistical evidence but a demonstration of the relevancy of that evidence. They should require, in other words, an understanding of concepts used in rhetorical context. Students becoming adept at these writing tasks not only move from data to conclusion but under-

stand that the quality (and depth) of both is based upon their interdependence.

The heavy reliance on reading may be legitimized by focusing not only what the authors said and how they said it, but by the responses, written and verbal, of the students, who become the valid interlocutors of their own thought and experience. Other objections to this interdisciplinary approach to the teaching of composition may also be anticipated, with the soundest being that we generally have little enough time as it is to teach writing without fooling around with mathematics. To some degree this is probably true, but only to the extent that it points out the deficiency of most composition courses, anyway, and the fact that they are often not reinforced by other departments. Mathematics departments, for example, could reciprocate to their advantage. Instead of just dashing off equations and algorithms (and sloppily at that), students could be required to put method and proof in paragraph form, to answer word problems with word solutions, and generally to demonstrate lexically the concepts which generate both.

It is a commonplace which finds superior expression in the writing of James, Whitehead, and Russell, that at the highest levels mathematics is much like poetry in its truth and beauty. But only at that stage? What James Kinneavy calls "referential discourse" needs to deal in the beauty of truth and with the factual language that often comprises it.[4] In this regard the language of mathematics can be invaluable in helping student writing present ideas as clearly and as forcefully as possible.

NOTES

[1] I use the word mathematics here to mean all levels of numerical symbolization, while realizing that much of everyday usage is simply arithmetic.

[2] (Boston: Houghton Mifflin, 1968), p. 212.

[3] (New York: Fawcett World, 1975).

[4] A Theory of Discourse (Englewood Cliffs, N.J.: Prentice Hall, 1971), Ch. 3.